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Applicant:	Klaus Bühler
Serial No:	09/995,408
U.S. Filed:	11/27/2001
Title:	Tool for Multi-Component Injection Molding of Plastic Toothbrush Bodies of Toothbrushes

Assistant Commissioner for Patents

Washington, D.C. 20231

PRELIMINARY AMENDMENT

Prior to the first office action, please amend the instant application as follows:

IN THE SPECIFICATION:

Please substitute the attached clean copies of the amended paragraphs of pages 1; 2; 3-6 for the corresponding paragraphs of the enclosed literal translation. A marked-up version of the paragraphs with all the changes shown is also attached.

IN THE CLAIMS:

Claims 1 through 13 of the literal translation are cancelled.

Please add the attached new claims 14-26 to the specification.

IN THE ABSTRACT:

Please replace the Abstract of the literal translation with the attached Abstract of the Disclosure.

REMARKS

Claims 1-13 of the literal translation have been cancelled and replaced with claims 14-26 drafted in proper U.S. format. Proper headings according to the guidelines for drafting a nonprovisional patent application under 35 U.S.C. 111(a) have been added. A proper Abstract of the Disclosure has been provided.

In view of the foregoing, it is submitted that this application is now in condition for allowance and such allowance is respectfully solicited.

Authorization is herewith given to charge any fees or any shortages in any fees required during prosecution of this application and not paid by other means to Patent and Trademark Office deposit account 50-1199.

Respectfully submitted on March 18, 2002,

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GEH/Encl.:new claims 14-26; amended paragraphs of pages 1; 2; 3-6 (clean copies and marked-up versions); Abstract of the Disclosure

NEW CLAIMS

14. A tool for multi-component injection molding of plastic toothbrush bodies (4) for toothbrushes, the tool comprising:

two tool halves (1,1') forming hollow mold spaces (2) and configured to move apart into an open position and to move together into a closed position;

wherein the hollow mold spaces (2) comprise first cavities for injection molding first components of the toothbrush body (4) and second cavities for forming second components of the toothbrush body (4), wherein the first cavities are delimited exclusively by the two tool halves (1, 1');

a transfer device (6) integrated into a first one of the two tool halves (1) and immersible into the first tool half (1);

wherein the transfer device (6) is configured to transfer injection-molded blanks (3) formed in the first cavities into the second cavities for injection molding the second components;

wherein the transfer device (6) in the closed position of the two tool halves (1, 1') is located outside of the first cavities;

wherein the transfer device (6) is configured to move, after injection molding of the first components, into the first cavities of the injection-molded blanks (3), to pick up the injection-molded blanks (3), and subsequently transport the injection-molded blanks into the second cavities for injection-molding the second components.

15. The tool according to claim 14, wherein the transfer device (6) is linearly moveable.

16. The tool according to claim 14, further comprising a T-shaped guide or an L-shaped guide (7) arranged in the first tool half (1), wherein the transfer device (6) is moveable on the T-shaped guide or the L-shaped guide (7) within the first tool half (1).

17. The tool according to claim 14, wherein the transfer device (6) is liftable off the first tool half (1).

18. The tool according to claim 14, wherein the transfer device (6) engages the

injection-molded blanks (3) on a side opposite the first tool half (1).

19. The tool according to claim 14, wherein the transfer device (6) picks up the injection-molded blanks (3) by a head (5) or a neck or a grip of the injection-molded blanks (43).

20. The tool according to claim 14, wherein the transfer device (6) has vacuum suction cups (11) for picking up the injection-molded blanks (3).

21. The tool according to claim 14, wherein the transfer device (6) delimits the second cavities for the second components.

22. The tool according to claim 14, wherein the first tool half (1) in the area for injection molding the second components has vacuum suction cups (10) for picking up the toothbrush body (4).

23. The tool according to claim 14, wherein the injection-molded toothbrush body (4) is arranged in the tool transversely to a moving direction along a movement path of the transfer device (6).

24. The tool according to claim 23, wherein on both sides of the movement path of the transfer device (6) transversely extending toothbrush bodies (4) are arranged.

25. The tool according to claim 14, wherein the injection molded toothbrush body (4) is oriented parallel to a movement direction of the transfer device (6).

26. The tool according to claim 14, wherein the hollow spaces (2) comprises additional cavities for injection molding additional components and wherein the transfer device (6) is configured to service the additional cavities.

CLEAN COPY OF AMENDED PARAGRAPH OF PAGE 1

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a tool for multi-component injection molding of plastic toothbrush bodies for toothbrushes wherein the tool comprises two tool halves between which the hollow mold spaces are formed and which can be moved apart and can be closed, as well as a transfer device integrated into one of the tool halves as well as immersible therein by which the injection-molded blanks can be transferred into the corresponding hollow mold spaces for injection molding a further component.

2. Description of the Related Art

CLEAN COPY OF AMENDED OF 1st AND 2nd PARAGRAPHS OF PAGE 2

SUMMARY OF THE INVENTION

Based on this, it is an object of the invention to provide an improved tool for multi-component injection molding of plastic toothbrush bodies for toothbrushes which does not cause burrs in the area of the head of the injection-molded toothbrush body.

The technical solution is characterized in that, for injection molding the first component, hollow mold spaces are formed exclusively by the two tool halves, in that the transfer device in the closed state of the tool is located outside of the area for injection molding the first component, and in that the transfer device can be moved after injection molding of the first component into the area of this injection-molded blank, picks up the injection-molded blanks, and subsequently transports them into the hollow mold spaces for injection-molding a further component.

CLEAN COPY OF 1st PARAGRAPH OF PAGE 3 TO
1st FULL PARAGRAPH OF PAGE 6

A further embodiment suggests that the transfer device is linearly movable. The transfer device can be, for example, a pneumatic cylinder with stop position damping at both ends. With such a transfer device, the injection-molded blanks are transported linearly into the position for injection-molding the second component so that overall the transfer device performs a back and forth movement during an injection-molding cycle.

A further embodiment suggests cross-section shapes of guides with which a technically simple and primarily reproducible movability of the transfer device is possible. In this connection, running plates can be provided, if desired, which are coupled with the transfer device.

A further preferred embodiment suggests that the transfer device can be lifted off the correlated tool half. In this way, the injection-molded blanks can be initially removed from their cavities in a vertical transverse direction in order to subsequently transfer them into their position for injection molding the second component where the transfer device is then returned into its immersed position. Inasmuch as for the transfer device a T-shaped or L-shaped guide is provided, the transverse beam of the "T" or the "L" has a corresponding lifting stroke. For lifting the transfer device, a pneumatic short-stroke cylinder for lifting and lowering the transfer device can be provided.

A further embodiment suggests a method as well as a constructive arrangement in order to first lift the injection-molded blank in an optimal way first from its cavity and then transfer it into the second cavity. The basic idea resides in that the transfer device grips the injection-molded blank from above and thus lifts it out of the cavity wherein the lifting movement can be assisted by tool ejectors in order to provide the necessary force for lifting.

According to a further preferred embodiment of the invention it is suggested that the transfer device receives the head of the injection-molded blank. The advantage resides in that for injection-molding the second component the transfer device can continue to engage the head because generally no further component must be injection molded in this head area. Instead, additional components are injection-molded generally onto the area of the grip of the toothbrush body. However, in the case that the second component is to be injection-molded onto the head, the transfer device will grip the neck (or the grip) instead of the head.

A further embodiment has the advantage that in a technically simple way the injection-molded blank can be taken from the cavity in that by a suction force pulling the injection-molded blank toward the transfer device, a force is generated which is large enough in order to overcome the securing force of the injection-molded blank in its cavity, wherein in this case moreover the lifting movement can be assisted by tool ejectors in order to provide the required force for lifting.

A further embodiment is based on the fact that the injection-molded blank is secured for injection molding of the further component by the transfer device and, in this way, the cavity of this transfer device represents a partial cavity of the hollow mold space for injection molding of the second component. However, this only means that the transfer device defines the cavity for receiving the injection-molded blank, but that outside of the area of the transfer device between the injection-molded blank and the two tool halves additional cavities exist into which the second component is injection-molded. Accordingly, no plastic is injected into the transfer device, i.e., the transfer device will not come into contact with the injection-molded plastic. It is provided only as a negative cavity of the already injection-molded shaped elements.

A further embodiment provides a possibility by means of which the finish-injection-molded toothbrush body can be secured within its cavity when the transfer device is extended for

"picking up" a new injection-molded blank. In this way, the finish-injection-molded product is secured by vacuum in the finish-injection-molding cavity, wherein the vacuum suction cups preferably - also - engage the head of the toothbrush body. Accordingly, the mold insert in the head area can be provided with corresponding vacuum suction cups.

A first variant in the arrangement of the toothbrush body is suggested according to which the heads of the toothbrush body are oriented toward the center because there the transfer device is located and this transfer device engages the injection-molded blank in its head area for the transfer process.

A second variant is suggested where the toothbrush body is aligned in the transfer direction of the transfer device.

In minimal configuration of the tool, two components can be injection molded. Of course, it is also conceivable to injection-mold the toothbrush bodies with more than two components. In this case, a further embodiment suggests that several stations for injection-molding of more than two components can be serviced by the transfer device.

BRIEF DESCRIPTION OF THE DRAWINGS

Two embodiments of a tool for multi-component injection molding of plastic-toothbrush bodies for toothbrushes are described in the following with the aid of the drawings. It is shown in:

Figs. 1a to 1h — a first embodiment of the tool in a plan view as well as a cross-section illustration, respectively, showing the course of the process steps;

Figs. 2a to 2h — a second embodiment of the tool in a plan view as well as a cross-sectional illustration and a longitudinal section illustration,

respectively, showing the course of the process steps.

DESCRIPTION OF PREFERRED EMBODIMENTS

The tool of the first embodiment according to Figs. 1a to 1h has two tool halves 1, 1' which can be moved away from one another and toward one another. These tool halves 1, 1' define between them hollow mold spaces 2 for injection-molding initially a first component and subsequently for injection-molding a second component. In this connection, the hollow mold spaces 2 are formed such that the injection-molded blank 3 or the finish-injection-molded toothbrush body 4 are aligned transversely to the longitudinal centerline of the tool and are oriented with their heads 5 toward one another.

MARKED-UP VERSION OF 1st PARAGRAPH OF PAGE 1

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a tool for multi-component injection molding of plastic toothbrush bodies for toothbrushes wherein the tool comprises two tool halves between which the hollow mold spaces are formed and which can be moved apart and can be closed, as well as a transfer device integrated into one of the tool halves as well as immersible therein by which the injection-molded blanks can be transferred into the corresponding hollow mold spaces for injection molding a further component ~~according to the preamble of claim 1~~.

2. Description of the Related Art

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SUMMARY OF THE INVENTION

Based on this, it is an object of the invention to provide an improved tool for multi-component injection molding of plastic toothbrush bodies for toothbrushes which does not cause burrs in the area of the head of the injection-molded toothbrush body.

The technical solution is characterized in that, for injection molding the first component, hollow mold spaces are formed exclusively by the two tool halves, in that the transfer device in the closed state of the tool is located outside of the area for injection molding the first component, and in that the transfer device can be moved after injection molding of the first component into the area of this injection-molded blank, picks up the injection-molded blanks, and subsequently transports them into the hollow mold spaces for injection-molding a further component ~~by the features of the characterizing portion of claim 1~~.

MARKED-UP VERSION OF 1st PARAGRAPH OF PAGE 3 TO
1st FULL PARAGRAPH OF PAGE 6

~~The~~ A further embodiment ~~according to claim 2~~ suggests that the transfer device is linearly movable. The transfer device can be, for example, a pneumatic cylinder with stop position damping at both ends. With such a transfer device, the injection-molded blanks are transported linearly into the position for injection-molding the second component so that overall the transfer device performs a back and forth movement during an injection-molding cycle.

~~The~~ A further embodiment ~~according to claim 3~~ suggests cross-section shapes of guides with which a technically simple and primarily reproducible movability of the transfer device is possible. In this connection, running plates can be provided, if desired, which are coupled with the transfer device.

A further preferred embodiment ~~according to claim 4~~ suggests that the transfer device can be lifted off the correlated tool half. In this way, the injection-molded blanks can be initially removed from their cavities in a vertical transverse direction in order to subsequently transfer them into their position for injection molding the second component where the transfer device is then returned into its immersed position. Inasmuch as for the transfer device a T-shaped or L-shaped guide is provided, the transverse beam of the "T" or the "L" has a corresponding lifting stroke. For lifting the transfer device, a pneumatic short-stroke cylinder for lifting and lowering the transfer device can be provided.

~~The~~ A further embodiment ~~according to claim 5~~ suggests a method as well as a constructive arrangement in order to first lift the injection-molded blank in an optimal way first from its cavity and then transfer it into the second cavity. The basic idea resides in that the transfer device grips the injection-molded blank from above and thus lifts it out of the cavity wherein the lifting movement can be assisted by tool ejectors in order to provide the

necessary force for lifting.

According to a further preferred embodiment of the invention ~~claim 6 suggests~~ it is suggested that the transfer device receives the head of the injection-molded blank. The advantage resides in that for injection-molding the second component the transfer device can continue to engage the head because generally no further component must be injection molded in this head area. Instead, additional components are injection-molded generally onto the area of the grip of the toothbrush body. However, in the case that the second component is to be injection-molded onto the head, the transfer device will grip the neck (or the grip) instead of the head.

~~The~~ A further embodiment ~~according to claim 7~~ has the advantage that in a technically simple way the injection-molded blank can be taken from the cavity in that by a suction force pulling the injection-molded blank toward the transfer device, a force is generated which is large enough in order to overcome the securing force of the injection-molded blank in its cavity, wherein in this case moreover the lifting movement can be assisted by tool ejectors in order to provide the required force for lifting.

~~The~~ A further embodiment ~~according to claim 8~~ is based on the fact that the injection-molded blank is secured for injection molding of the further component by the transfer device and, in this way, the cavity of this transfer device represents a partial cavity of the hollow mold space for injection molding of the second component. However, this only means that the transfer device defines the cavity for receiving the injection-molded blank, but that outside of the area of the transfer device between the injection-molded blank and the two tool halves additional cavities exist into which the second component is injection-molded. Accordingly, no plastic is injected into the transfer device, i.e., the transfer device will not come into contact with the injection-molded plastic. It is provided only as a negative cavity of the already injection-molded shaped elements.

~~The~~ A further embodiment ~~according to claim 9~~ provides a possibility by means of which the finish-injection-molded toothbrush body can be secured within its cavity when the transfer device is extended for "picking up" a new injection-molded blank. In this way, the finish-injection-molded product is secured by vacuum in the finish-injection-molding cavity, wherein the vacuum suction cups preferably - also - engage the head of the toothbrush body. Accordingly, the mold insert in the head area can be provided with corresponding vacuum suction cups.

A first variant in the arrangement of the toothbrush body is suggested according to which ~~by the claims 10 and 11. In this arrangement,~~ the heads of the toothbrush body are oriented toward the center because there the transfer device is located and this transfer device engages the injection-molded blank in its head area for the transfer process.

A second variant is suggested ~~according to claim 12,~~ where the toothbrush body is aligned in the transfer direction of the transfer device.

In minimal configuration of the tool, two components can be injection molded. Of course, it is also conceivable to injection-mold the toothbrush bodies with more than two components. In this case, ~~the~~ a further embodiment ~~according to claim 13~~ suggests that several stations for injection-molding of more than two components can be serviced by the transfer device.

BRIEF DESCRIPTION OF THE DRAWINGS

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illustration, respectively, showing the course of the process steps;

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ABSTRACT OF THE DISCLOSURE

A tool for multi-component injection molding of plastic toothbrush bodies for toothbrushes has two tool halves which can be opened and closed. In one tool half a linearly movable transfer device is arranged. The hollow mold spaces for injection molding the first component are formed exclusively by the two tool halves. For transferring the injection-molded blanks into the second station, the transfer device moves into the area of the injection-molded blanks, picks them up by vacuum suction cups, and transfers the injection-molded blanks by linear movement into the second station.